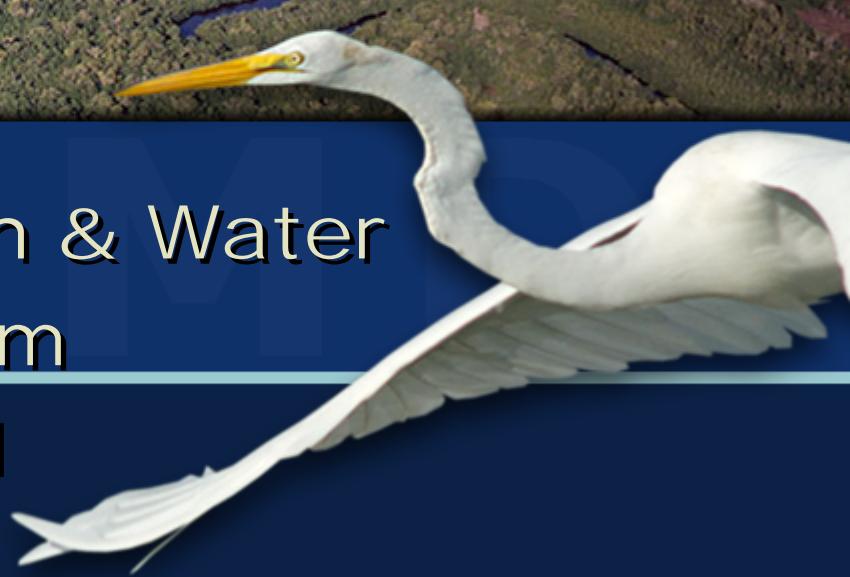




Northern Everglades
River Watershed Research & Water
Quality Monitoring Program
St. Lucie River Watershed



November 2007



Agenda

- **Introduction and Opening Remarks**
- **Update**
 - **Objectives**
 - **Outline**
 - **Schedule**
- **Water Quality Status and Trend**
- **Discussion**
- **Public Comment Period***
- **Closing Remarks and Action Items**
- * As time permits, a brief Public Comment Period will be held at this point in the agenda



Objective, outline and schedule

- **Initiate SLRW Research and Water Quality Monitoring Plan – 09/07**
- **Task 1 –Identify Goals and Objectives of the Plan – 11/07**
- **Task 2 – Establish Status, Trends and Targets in Hydrology, Water Quality and Aquatic Habitat - 11/07 - 01/08**
 - **Task 2.1 Delineation of Study Area**
 - **Task 2.2 Watershed Hydrology and Loading**
 - **Task 2.3 River/estuary salinity, water quality and the related aquatic habitats**
 - **Task 2.4 Salinity Envelopes and Freshwater Inflow Targets**
 - **Task 2.5 Influence of Lake Okeechobee and Watershed Discharge on Delivery to SLRE**



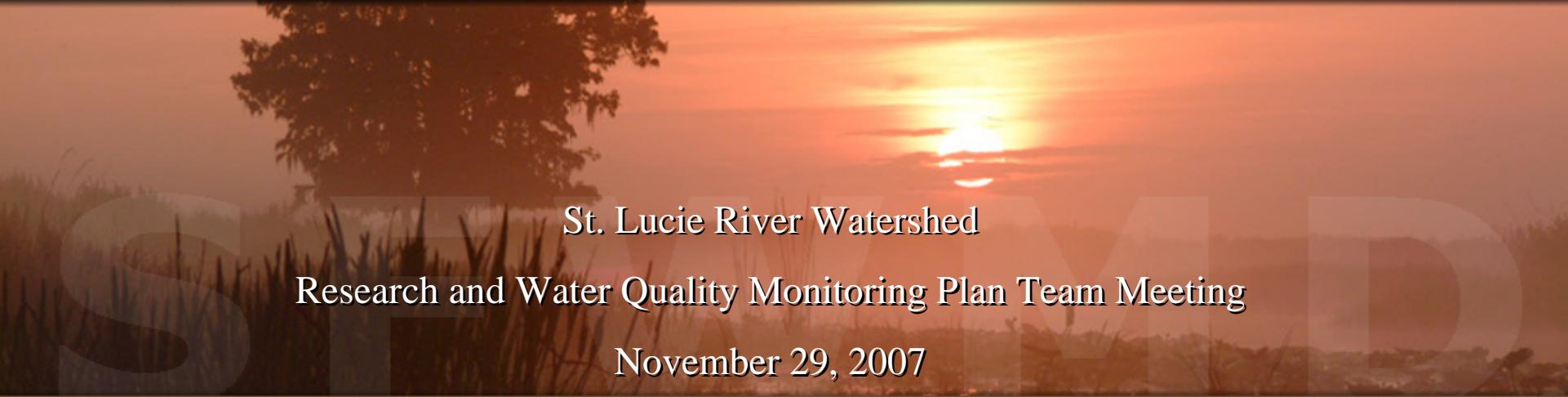
Objective, outline and schedule

- **Task 3 –Monitoring on a Regional Scale – 12/07 - 03/08**
 - **Task 3.1 Define Regional Scale Monitoring**
 - **Task 3.2 Compile and Evaluate Existing Water Quality Monitoring Program**
 - **Task 3.3 Compile and Evaluate Existing Freshwater Inflow Monitoring Program**
 - **Task 3.4 Compile and Evaluate Existing Aquatic Habitat Monitoring Program**
 - **Task 3.5 Conduct Power Analysis- Water Quality and SAV Example**
- **Task 4 –Monitoring on a Project Scale – 01/08 - 04/08**
 - **Task 4.1 Define Project Level Monitoring**
 - **Task 4.2 Summarize Projects Considered in the Plan**



Objective, outline and schedule

- **Task 5 –Research for Adaptive Management – 03/08 - 04/08**
 - **Task 5.1 Identify Research Purpose**
 - **Task 5.2 Summarize Status of Current Research Related to Water Quality**
 - **Task 5.3 Summarize Status of Current Assessment Tools**
- **Task 6- Develop Recommendations – 05/08 – 06/08**
- **Task 7- Internal and External Working Team Meetings – 09/08**
- **Task 8- Compilation of Draft Research and Water Quality Monitoring Plan – 07/08**
- **Task 9- Final Research and Water Quality Monitoring Plan - 08/08 – 09/08**
 - **Task 9.1 - Incorporate Final Plan into the River Protection Plan**



St. Lucie River Watershed

Research and Water Quality Monitoring Plan Team Meeting

November 29, 2007

Water Quality Status and Trend

St. Lucie River Watershed Research and Water Quality Monitoring Plan Objectives

- Adequate Monitor Station to Quantify Project Level Load Reduction
- Adequate Monitoring to Measure Effects of Load Reductions
- Adequately Assess Water Volumes and Relative Timing of Water Entering Estuary



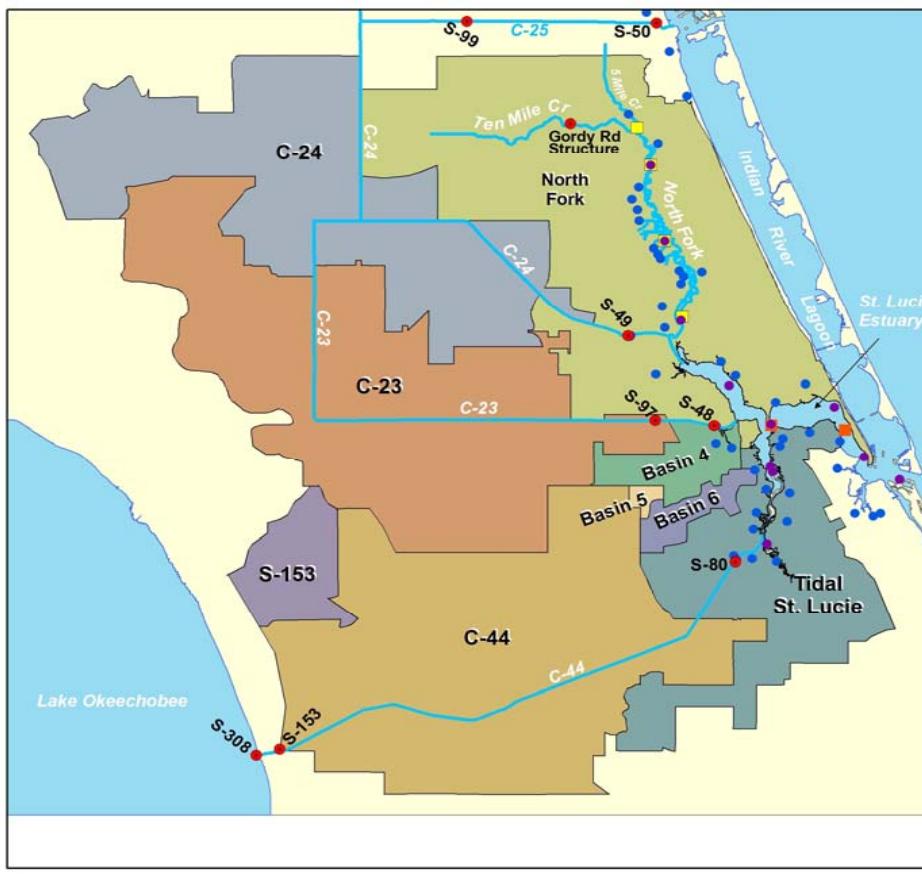
Objectives - continue

- Identify and develop tools (e.g. models) to predict nutrient load reductions achieved by management measures and associated ecosystem response.

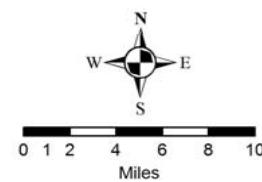
- Provide necessary data to support and improve predictive tools and apply adaptive management.



Water Quality Monitoring Stations: System-wide

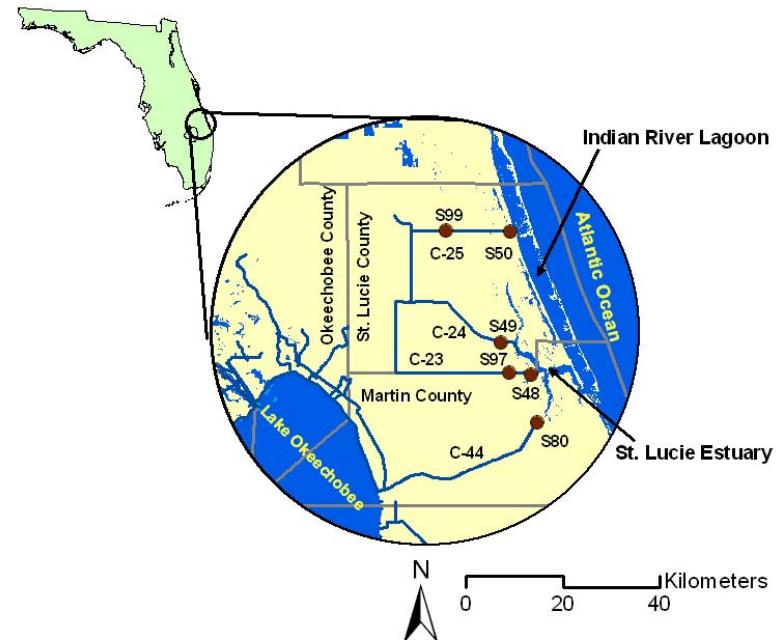


- St. Lucie Tributary (SLT) Water Quality Monitoring Sites
- St. Lucie Estuary Stage and Salinity Monitoring Sites
- St. Lucie North Fork Stage and Salinity Monitoring Sites
- St. Lucie Estuary (SE) Water Quality Monitoring Sites
- SFWMD Water Quality Monitoring (WQM) Sites



District Structure Water Quality Monitoring (WQM) Network

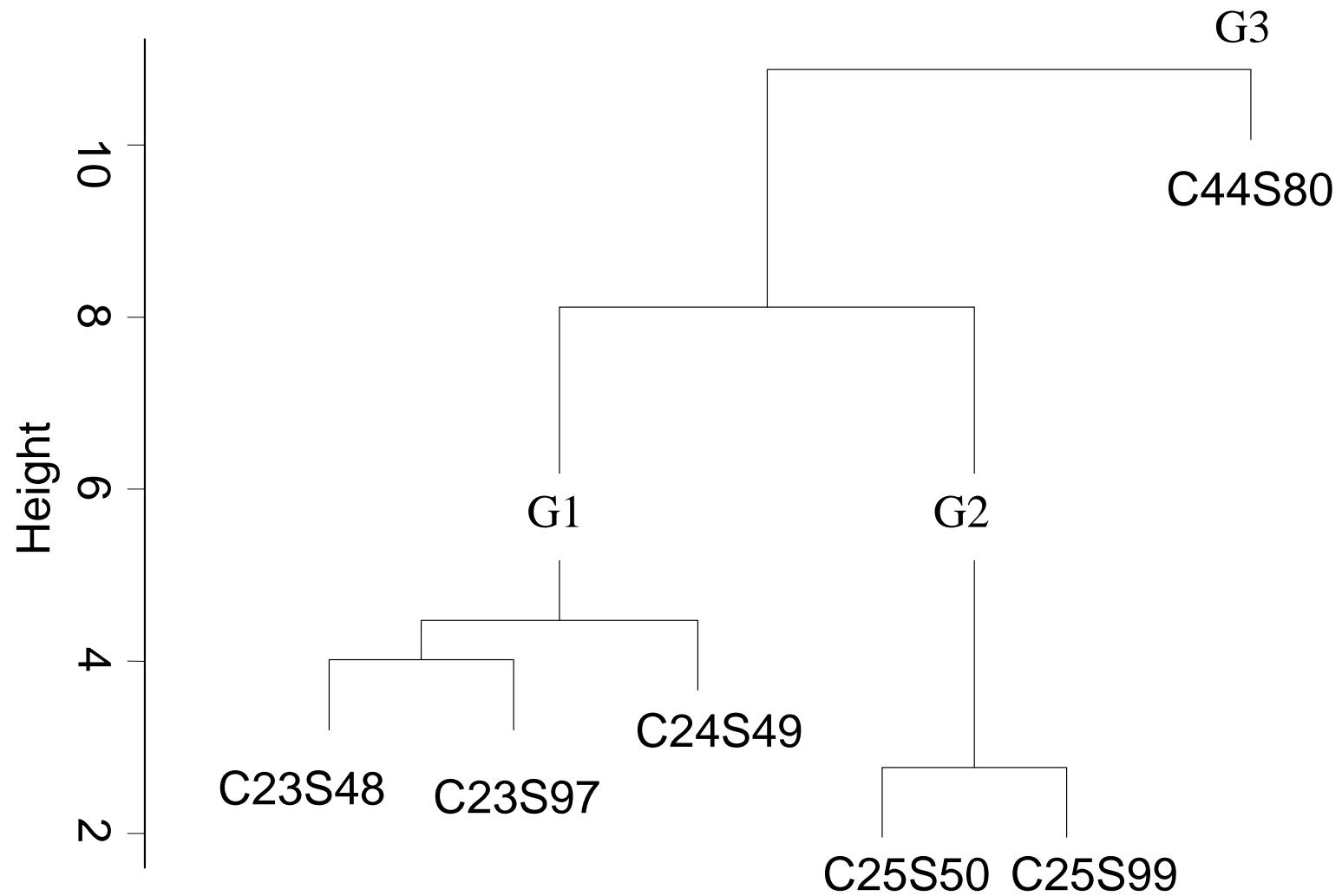
- Flow and water quality of C-44, C-23, C-24, and C-25 basins
- Monthly WQ data since 1980
- Temp, pH, Cond, DO, NH4, NOx, TKN, PO4, TPO4 TSS, Turb, Cr, Mg, As, Cu



WQM Water Quality Monitoring Stations



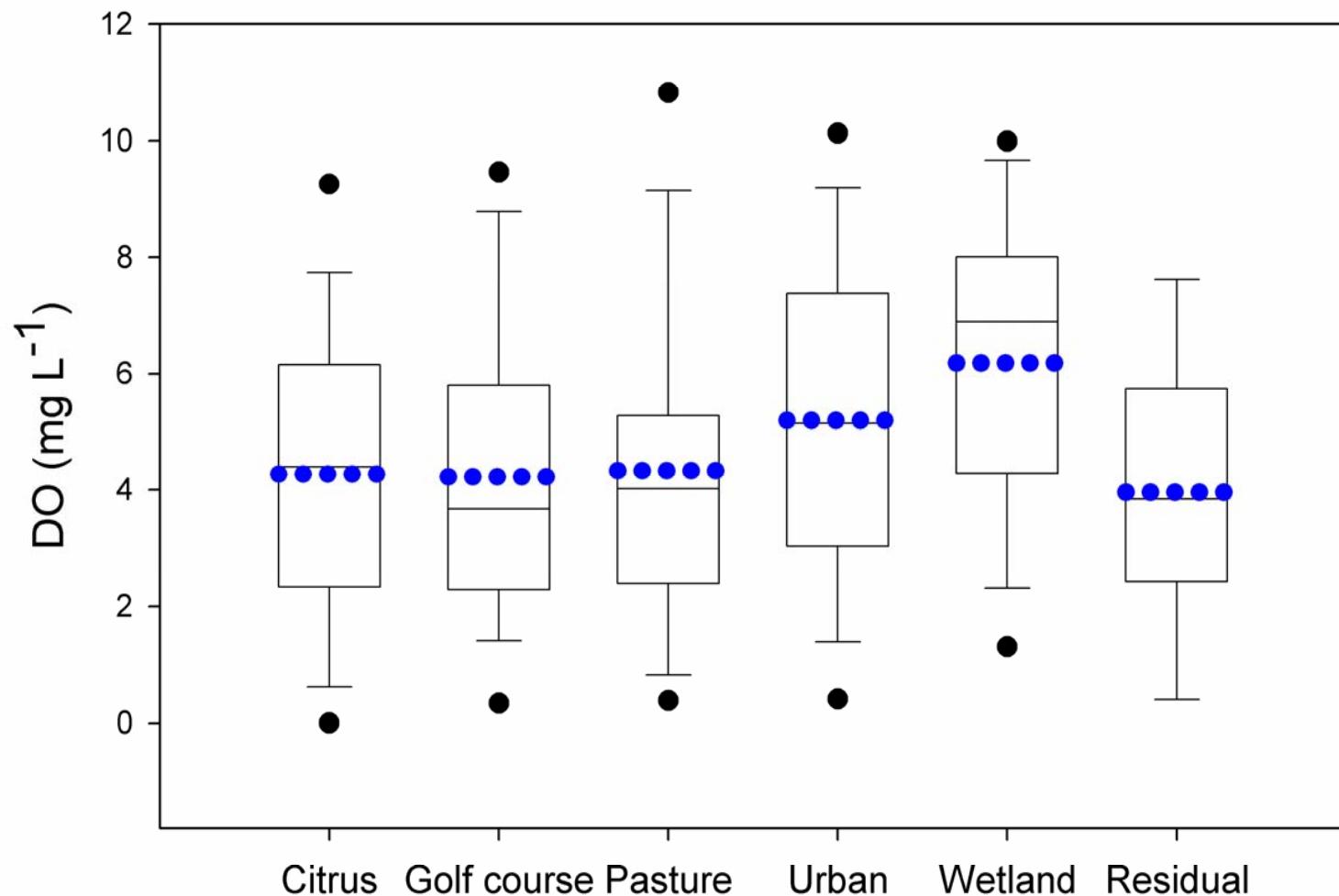
WQM Water Quality Data: Cluster Analysis



WQM Water Quality Data: Summary

	DO	NO_x-N	NH₄-N	TKN	PO₄-P	TP
C-23 and C-24						
Min	0.1	-	-	-	-	0.025
Mean	5.0	0.113	0.10	1.33	0.183	0.290
Median	4.9	0.071	0.07	1.30	0.161	0.262
Max	29.3	1.636	0.87	10.48	0.879	1.400
Skewness	1.91	3.46	1.77	3.72	1.29	1.25
C-25						
Min	0.3	-	-	-	-	-
Mean	4.8	0.115	0.08	1.24	0.085	0.162
Median	4.6	0.092	0.07	1.22	0.062	0.127
Max	12.8	1.293	1.42	6.19	0.710	1.046
Skewness	0.46	3.39	5.42	0.88	2.30	2.17
C-44						
Min	0.8	-	-	-	0.005	0.045
Mean	6.1	0.234	0.05	1.16	0.085	0.156
Median	6.3	0.215	0.04	1.12	0.064	0.134
Max	12.4	0.858	0.44	3.04	0.368	0.446
Skewness	-0.01	0.96	2.21	0.10	1.65	1.16

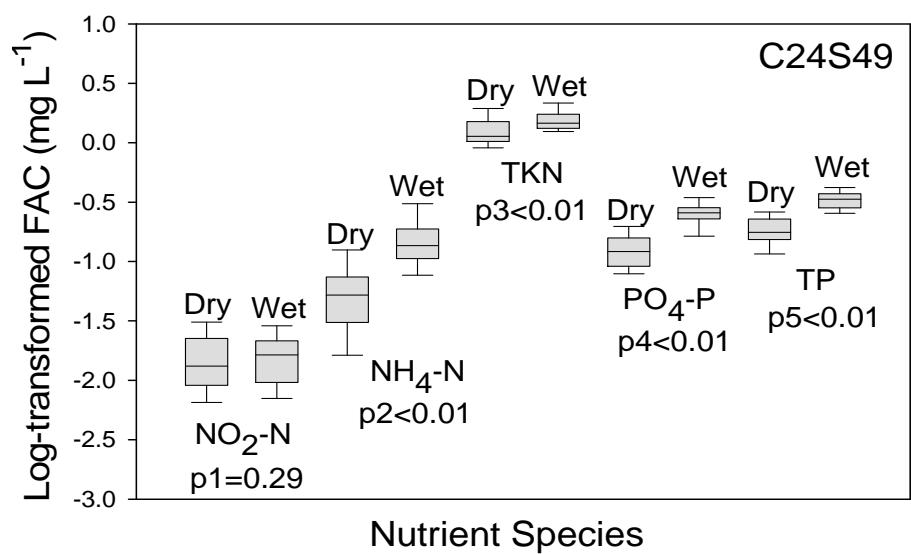
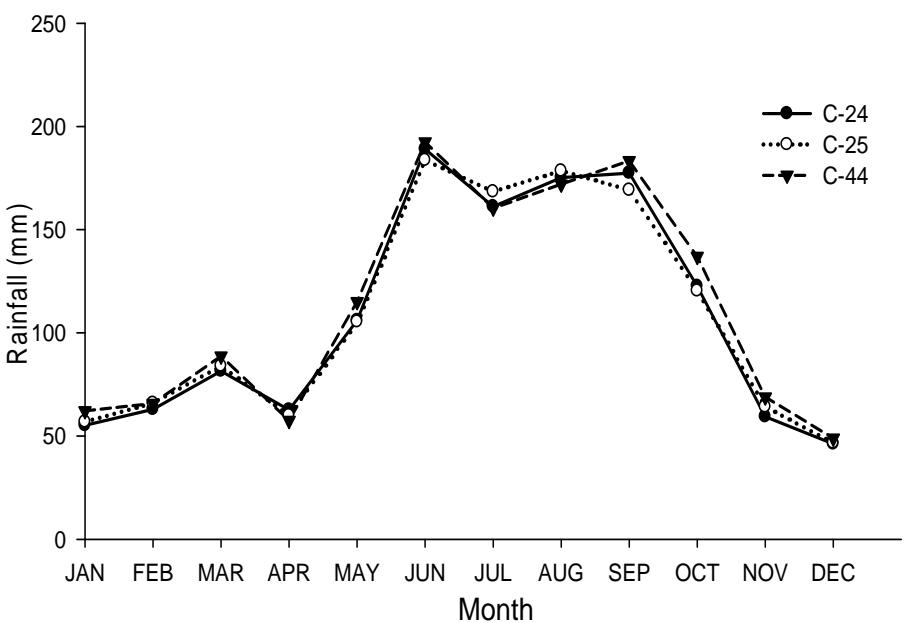
Land Use Water Quality Data: DO



Land Use Water Quality Data

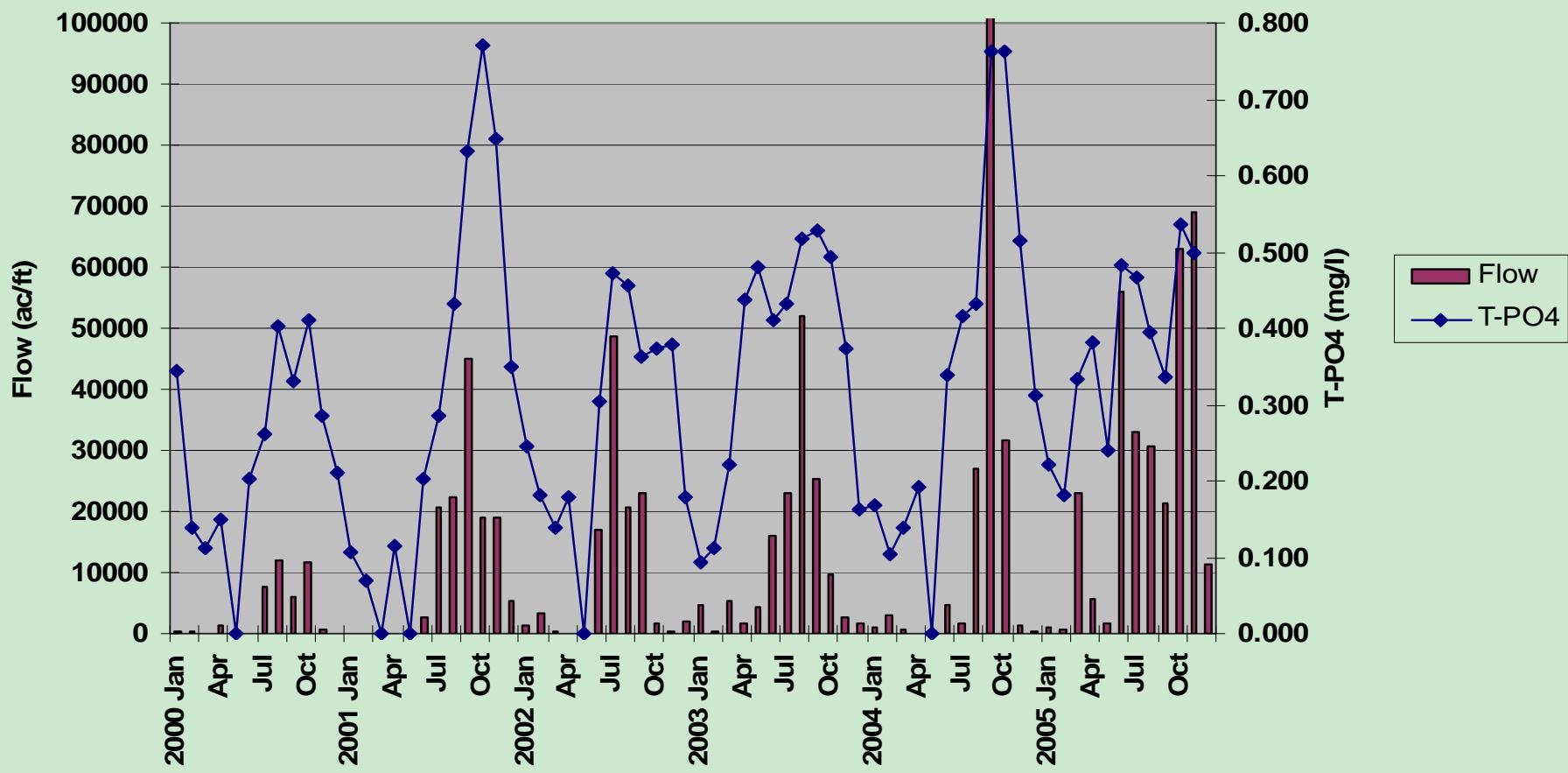
Land use	Number Samples	Total P (mg L ⁻¹)		Total N (mg L ⁻¹)		Organic N (mg L ⁻¹)		Inorganic N (mg L ⁻¹)	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
Citrus	127	0.29	0.16	1.37	1.23	1.11	1.05	0.26	0.13
Pasture	53	0.29	0.22	1.46	1.09	1.32	0.94	0.15	0.08
Urban	115	0.22	0.09	1.07	0.82	0.92	0.72	0.13	0.05
Golf course	28	0.24	0.19	1.62	1.51	1.27	1.22	0.32	0.22
Wetland	30	0.02	0.01	1.18	0.94	1.10	0.99	0.14	0.02
Row crop	20	0.63	0.45	1.88	1.31	1.14	0.97	0.77	0.33
Residual	21	0.26	0.20	1.09	0.87	0.87	0.81	0.21	0.14
Dairy	8	12.54	8.86	38.9	24.6	9.98	7.39	28.9	11.5

WQM Water Quality Data: Seasonality



WQM Water Quality Data: Seasonality

C-23 Canal 2000 - 2005
Flow & T-PO4 Flow Weighted Mean

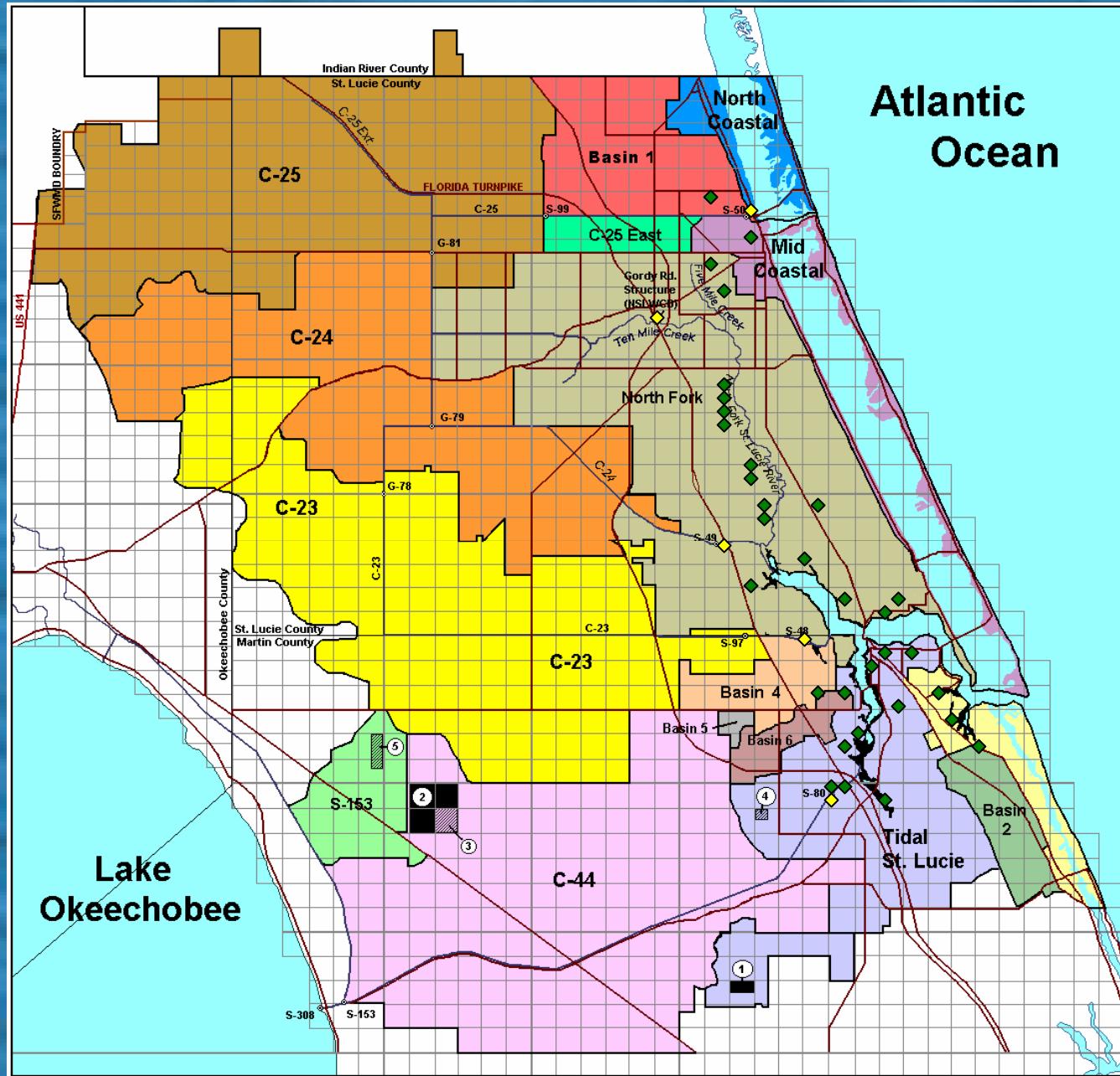


St. Lucie Tributary Water Quality Monitoring Network

- **38 Original Urban Tributary Sites (SLE/SIRL)**
- **19 Existing Sites**
 - **15 Sites w/Flow Recorders (Jan. 2005)**
- **Bi-weekly sampling events collected under flow conditions**
- **Metals collected monthly collected regardless of flow**



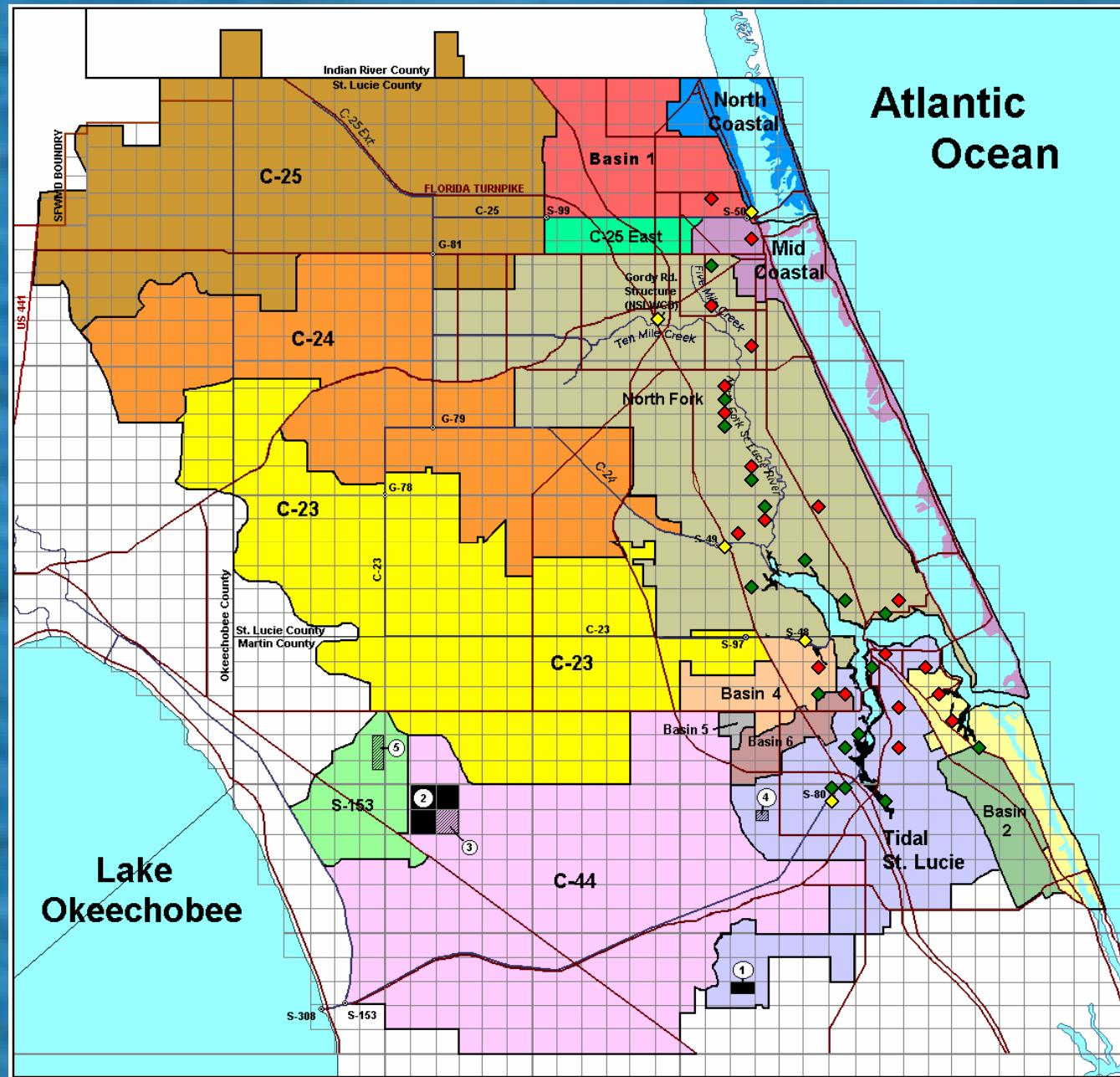
SOUTH FLORIDA WATER MANAGEMENT DISTRICT



Atlantic
Ocean

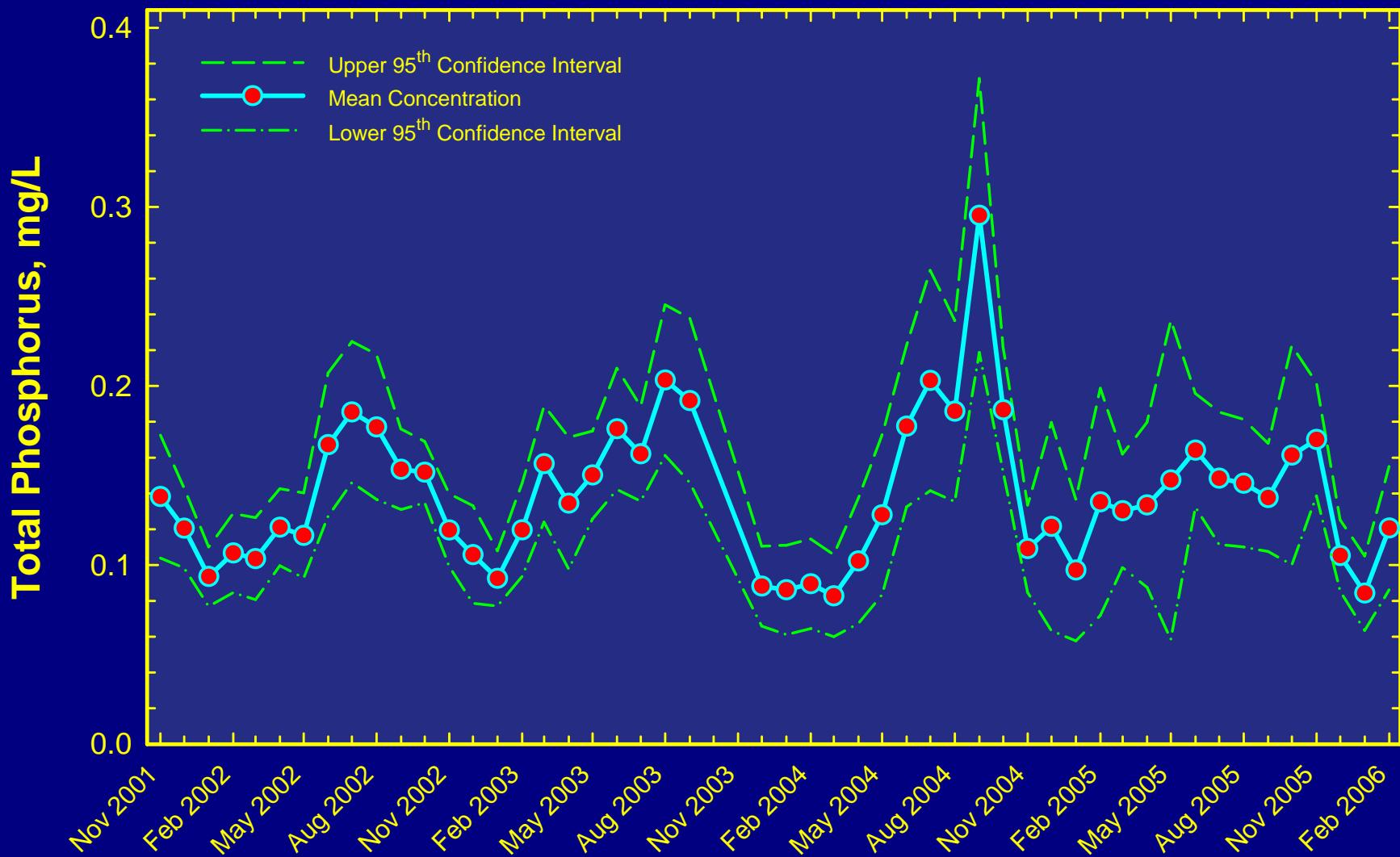
- ◆ SLT Monitoring Sites
- ◆ WQM Monitoring Sites

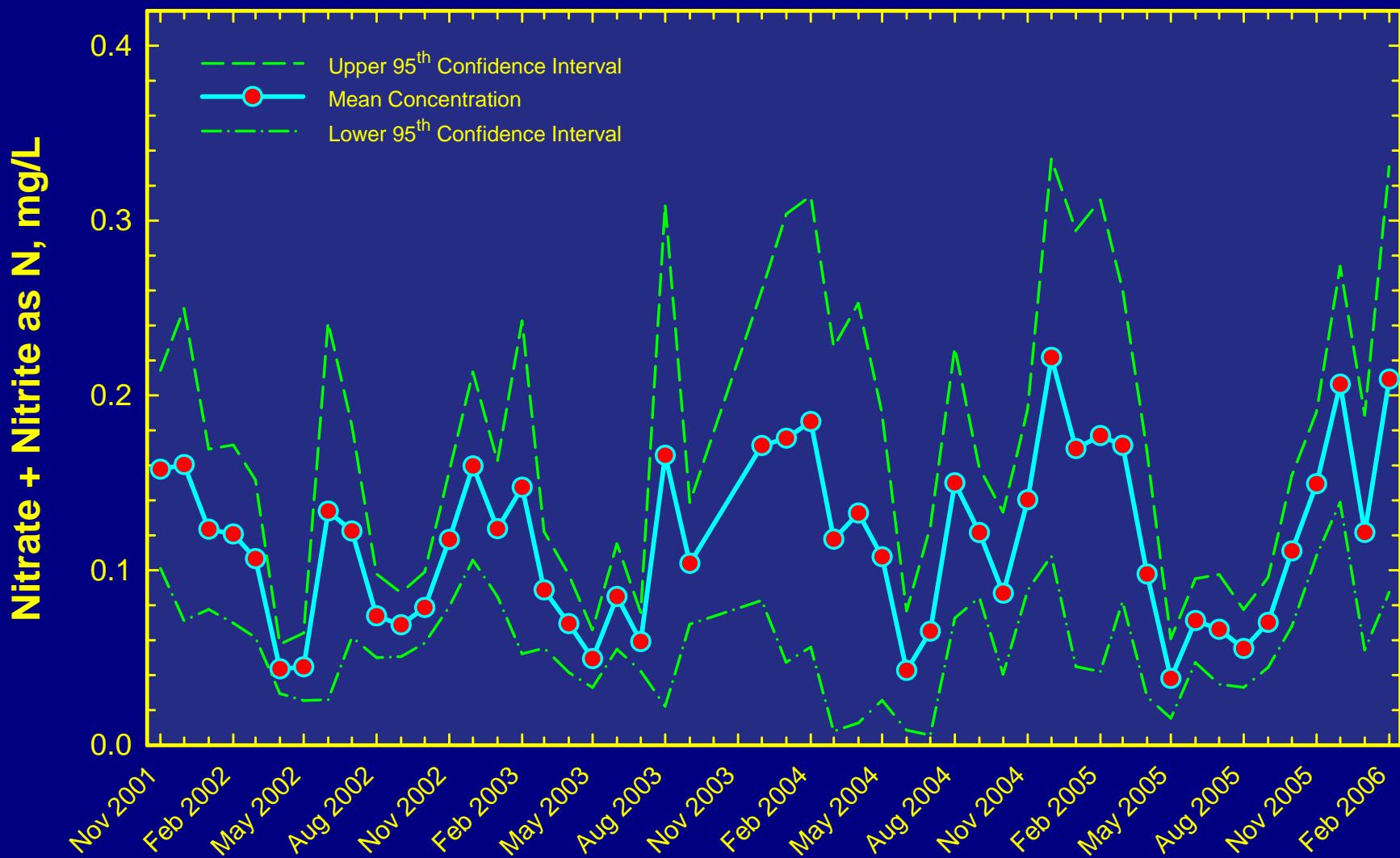
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

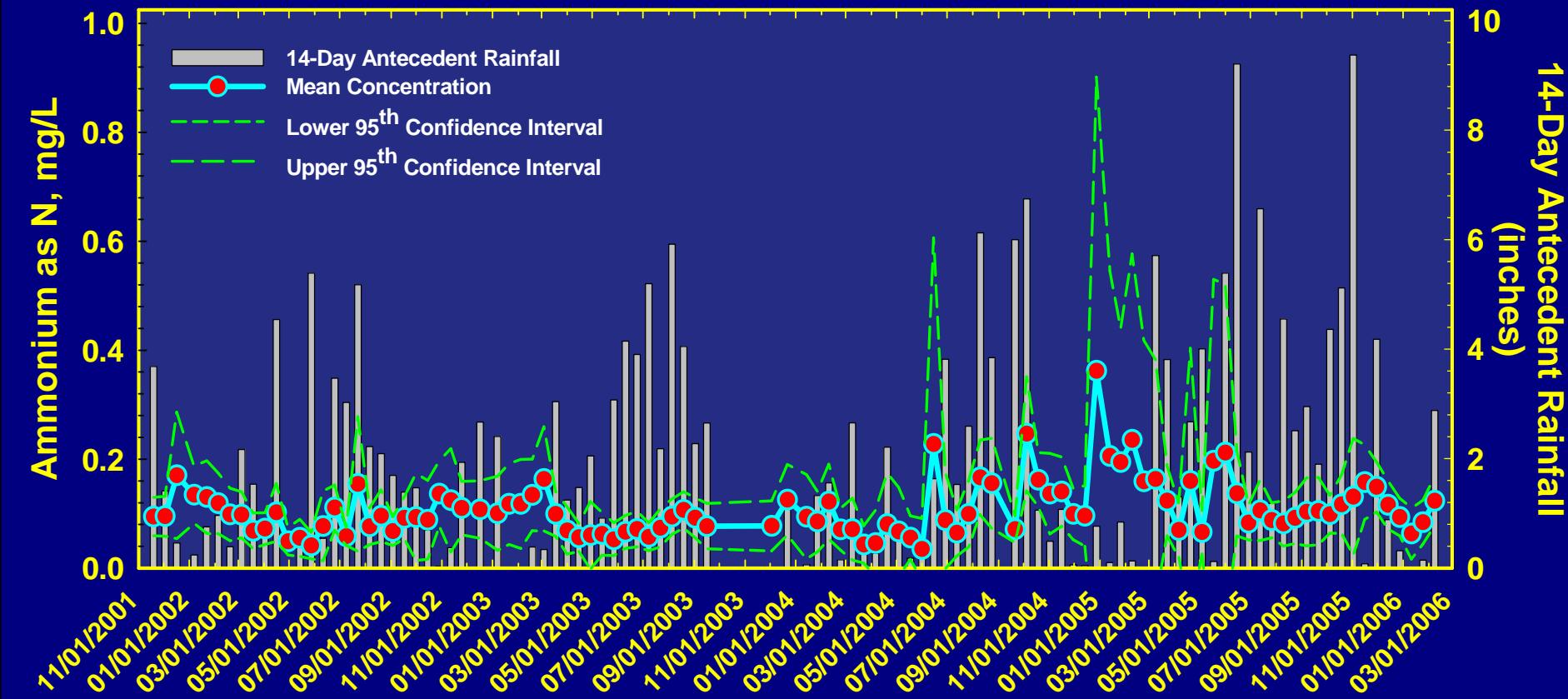


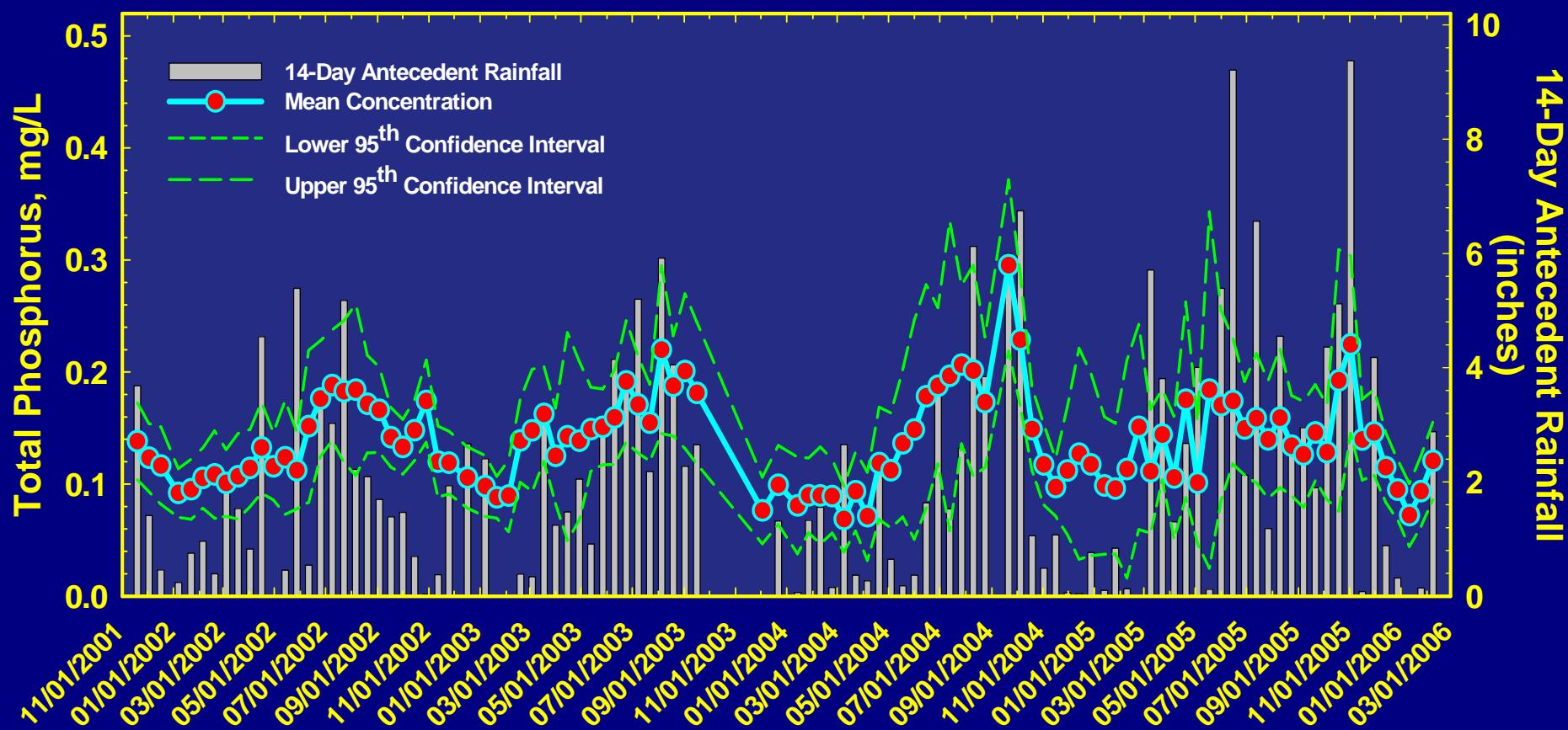
Atlantic
Ocean

- ◆ New SLT Monitoring Sites Flow & Rain
- ◆ Old SLT Monitoring Sites
- ◆ WQM Monitoring Sites

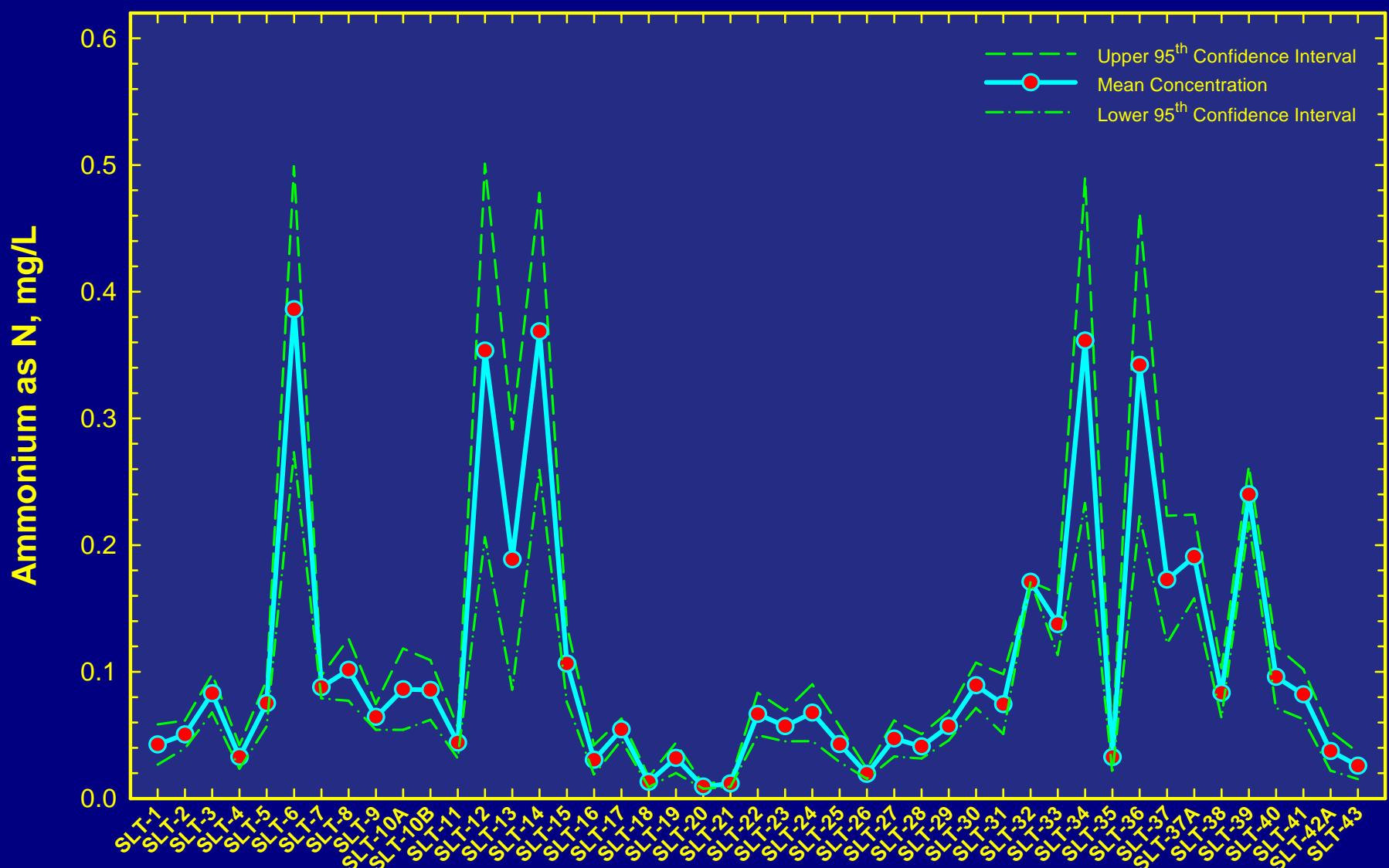


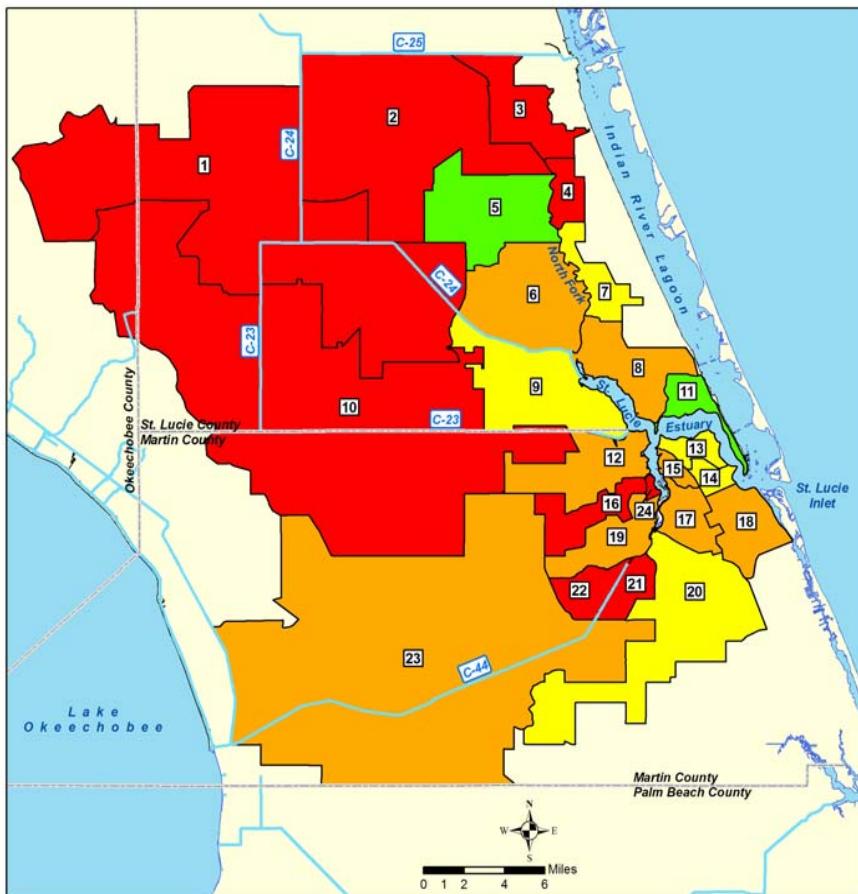




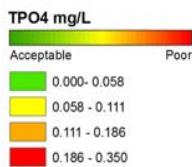


SOUTH FLORIDA WATER MANAGEMENT DISTRICT

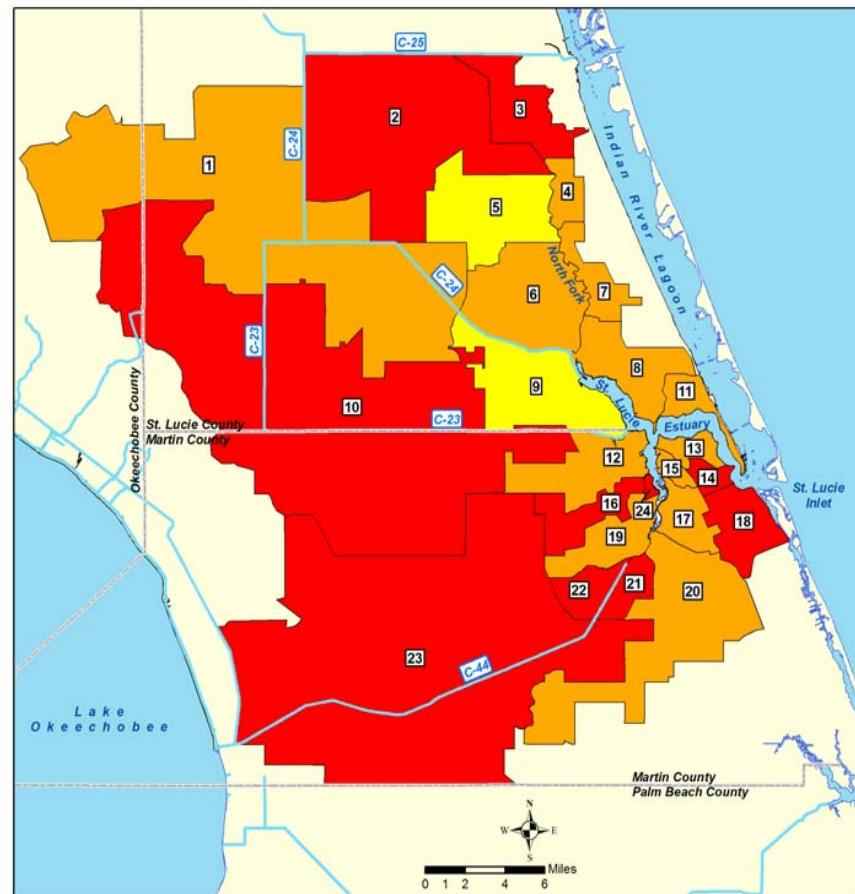




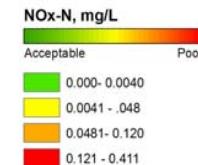
Total Phosphorus From Each Sub Basin in the St. Lucie Estuary Watershed



- | | | |
|-----------------------|-----------------------|-------------------|
| 1 C-24 | 11 Warner Creek | 20 South Fork |
| 2 Ten Mile Creek | 12 Bessey Creek | 21 Roe buck Creek |
| 3 Five Mile Creek | 13 Frazier Creek | 22 Hog Creek |
| 4 Platts Creek | 14 Willoughby Creek | 23 C-44 |
| 5 St. James Canals | 15 Poppelton Creek | 24 Old Palm City |
| 6 Port SL Canals | 16 Danforth Creek | |
| 7 Hogpen Slough | 17 Coral Garden Ditch | |
| 8 Britt/Howard Creeks | Fern Creek | |
| 9 Blakleys Creek | 18 Manatee Creek | |
| 10 C-23 | 19 Mapp Creek | |



Nitrate + Nitrite as N From Each Sub Basin in the St. Lucie Estuary Watershed



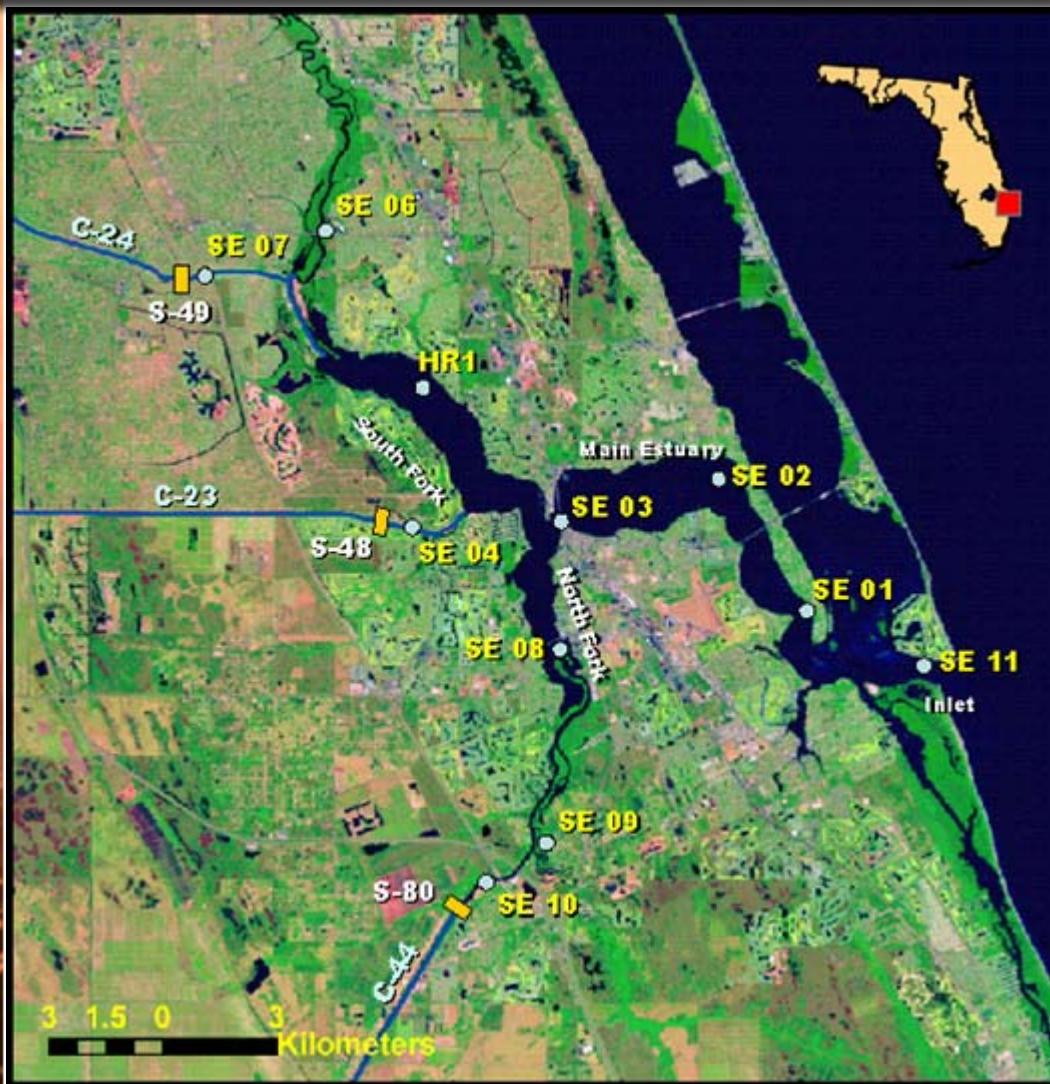
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St. Lucie Estuary Water Quality Monitoring Network

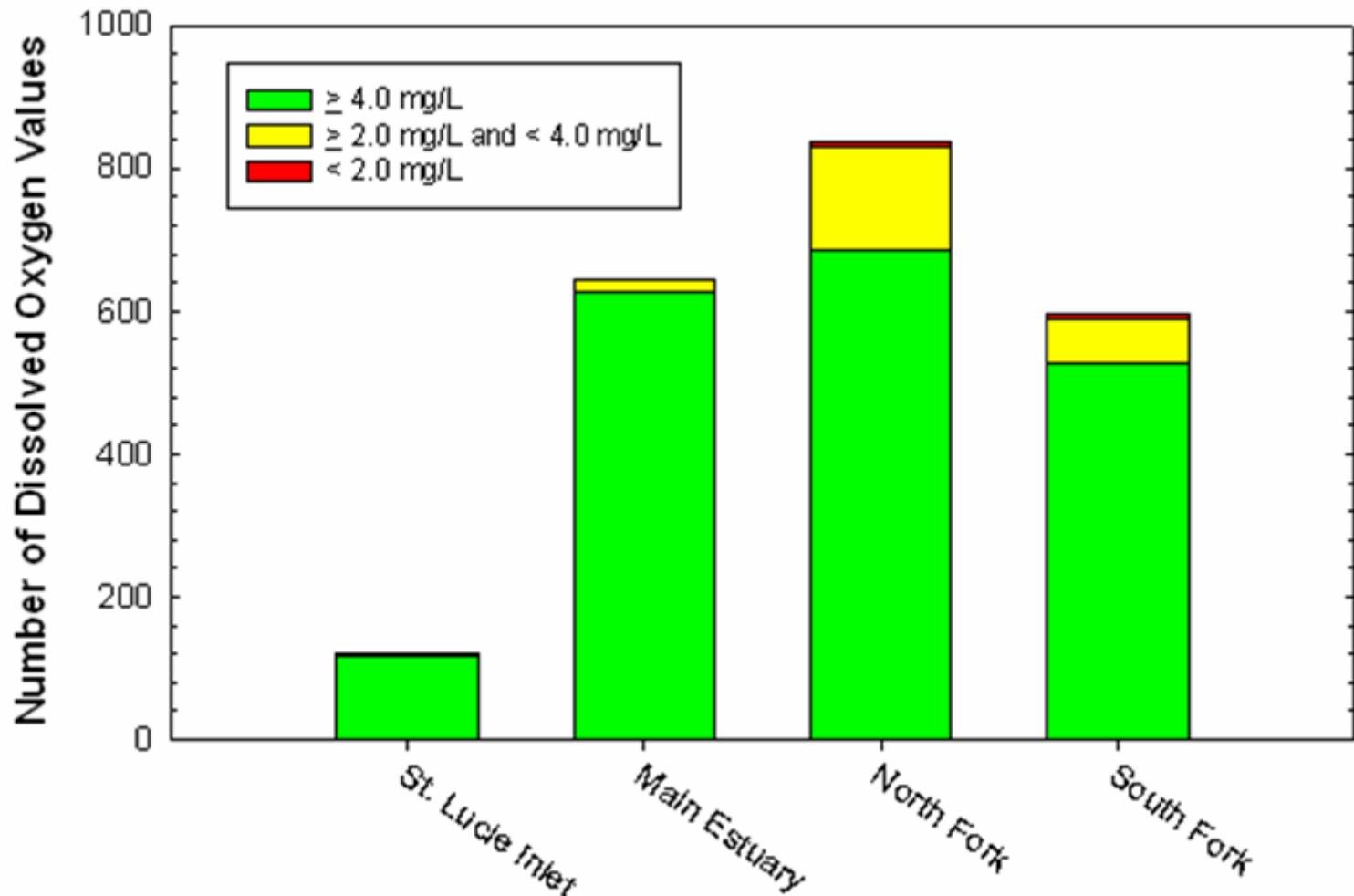
- 13 Sites
- Monthly WQ sampling
- TP, TKN, NOx, NH4, NO2, PO4, Color, TSS, VSS, Turb, Chla, Cha2, Light Atten, Salinity, D.O., pH, Temp. Depth, Secchi



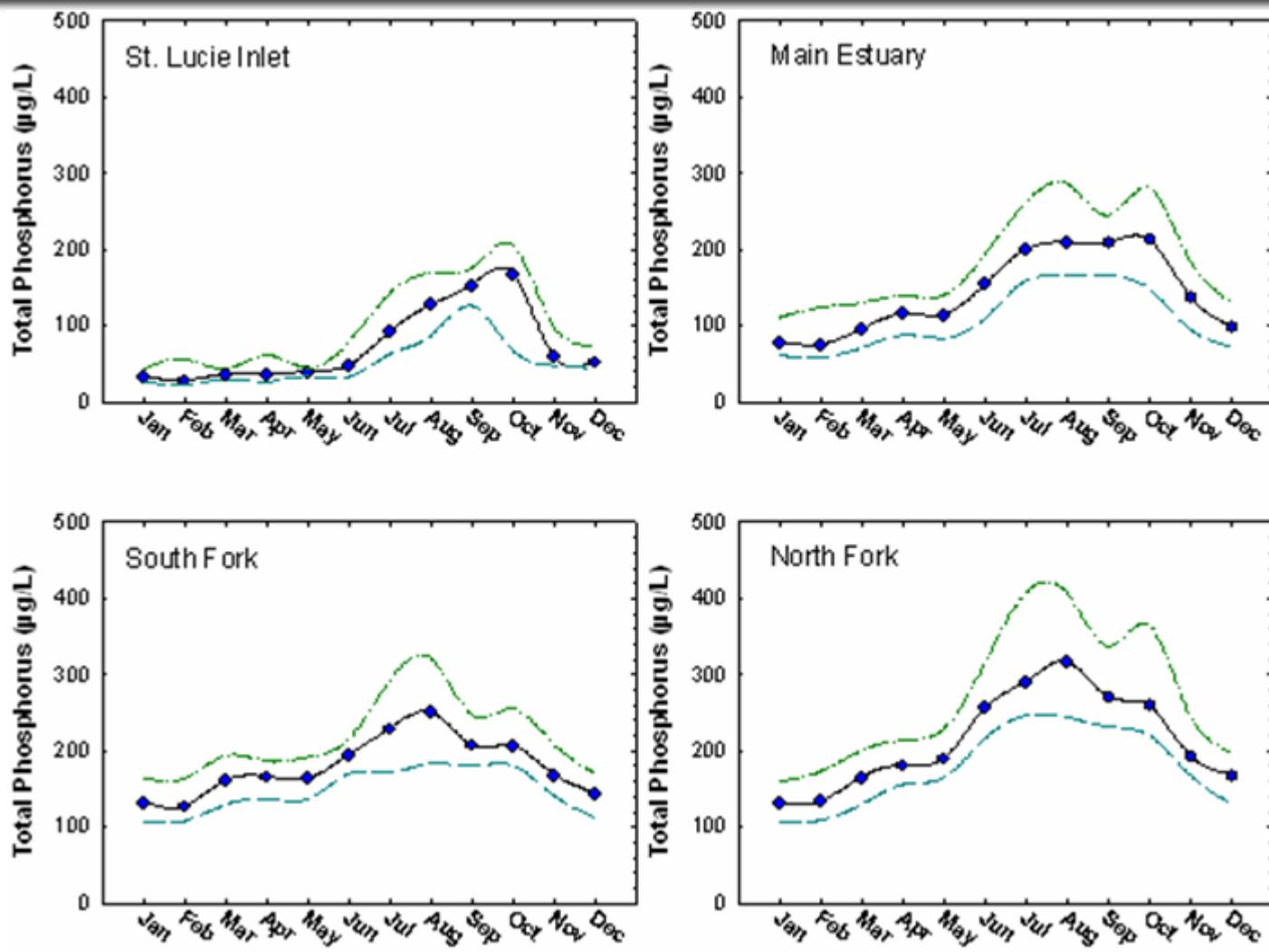
SLE Water Quality Monitoring Stations



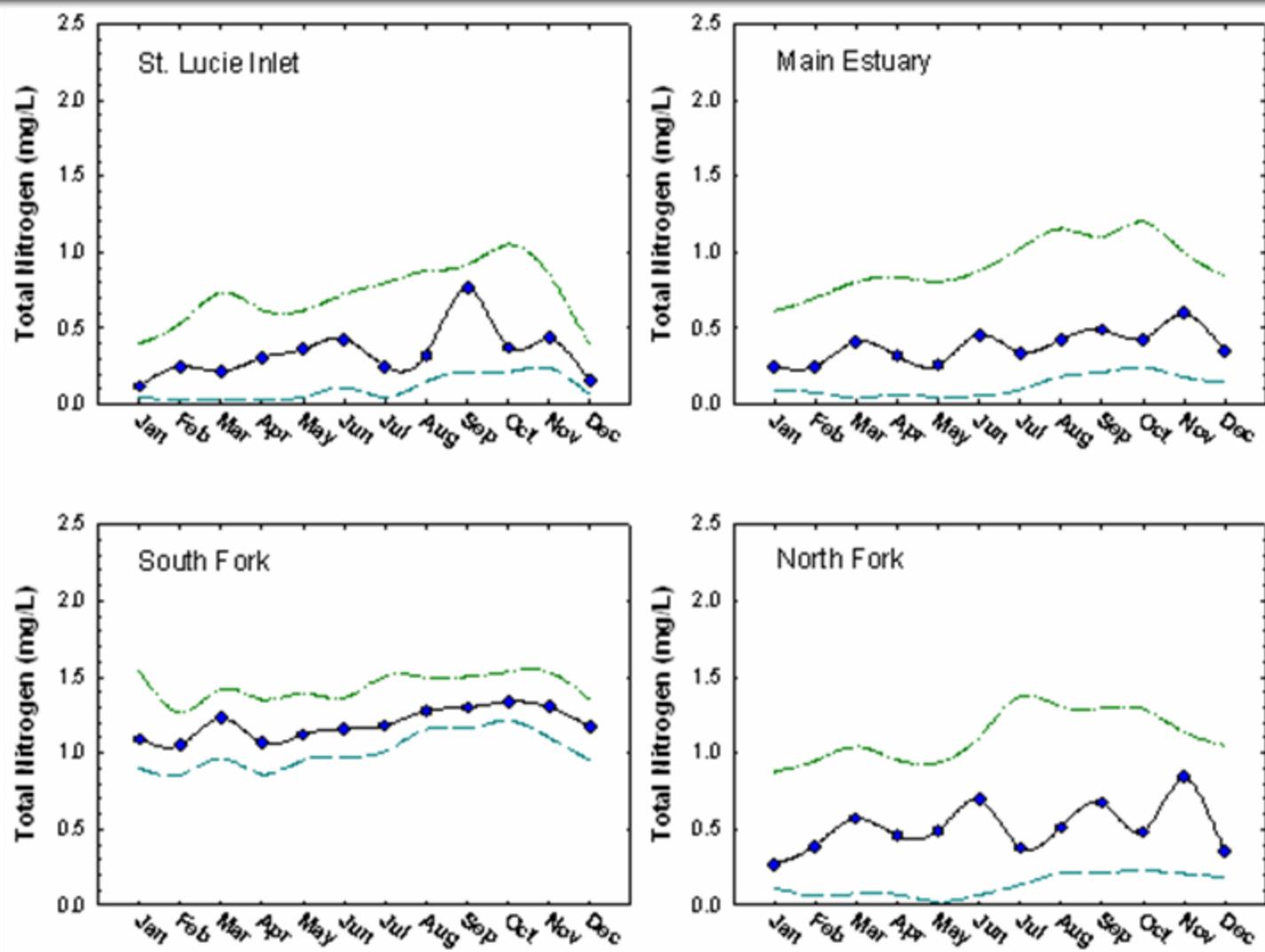
Number of Dissolved Oxygen Values in SLE

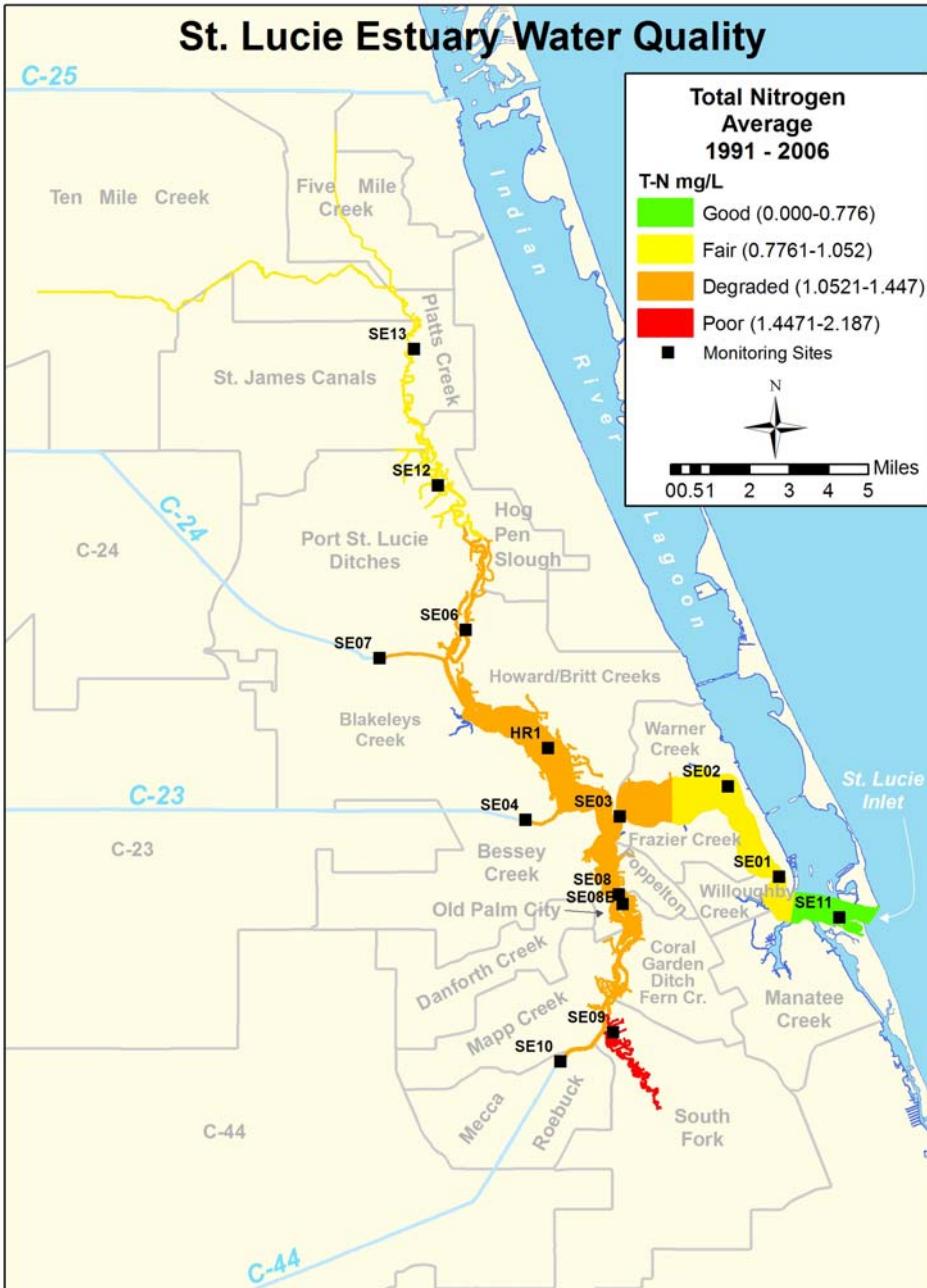
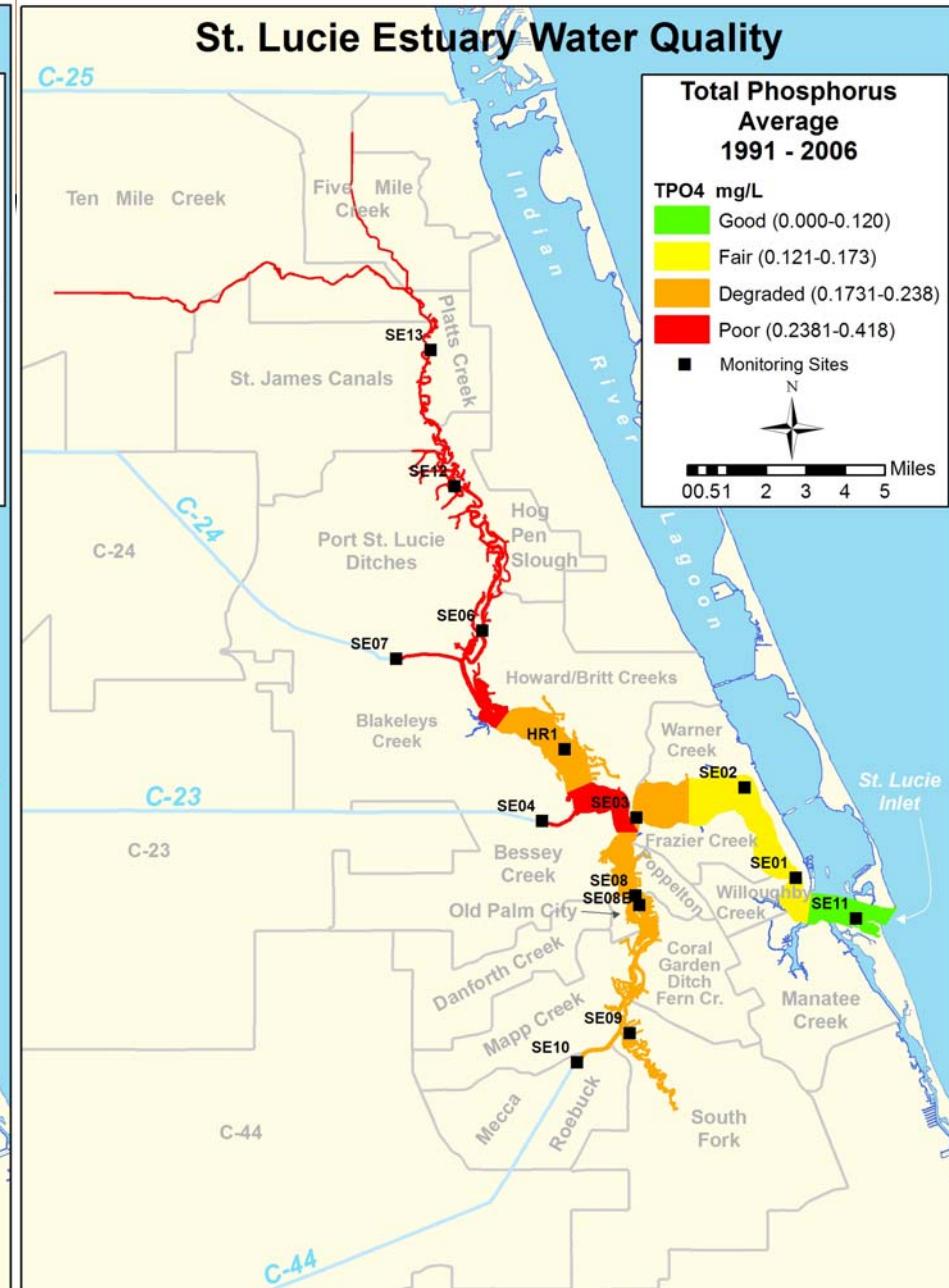


SLE Monthly Median TP Concentration (+/- 25% percentile)

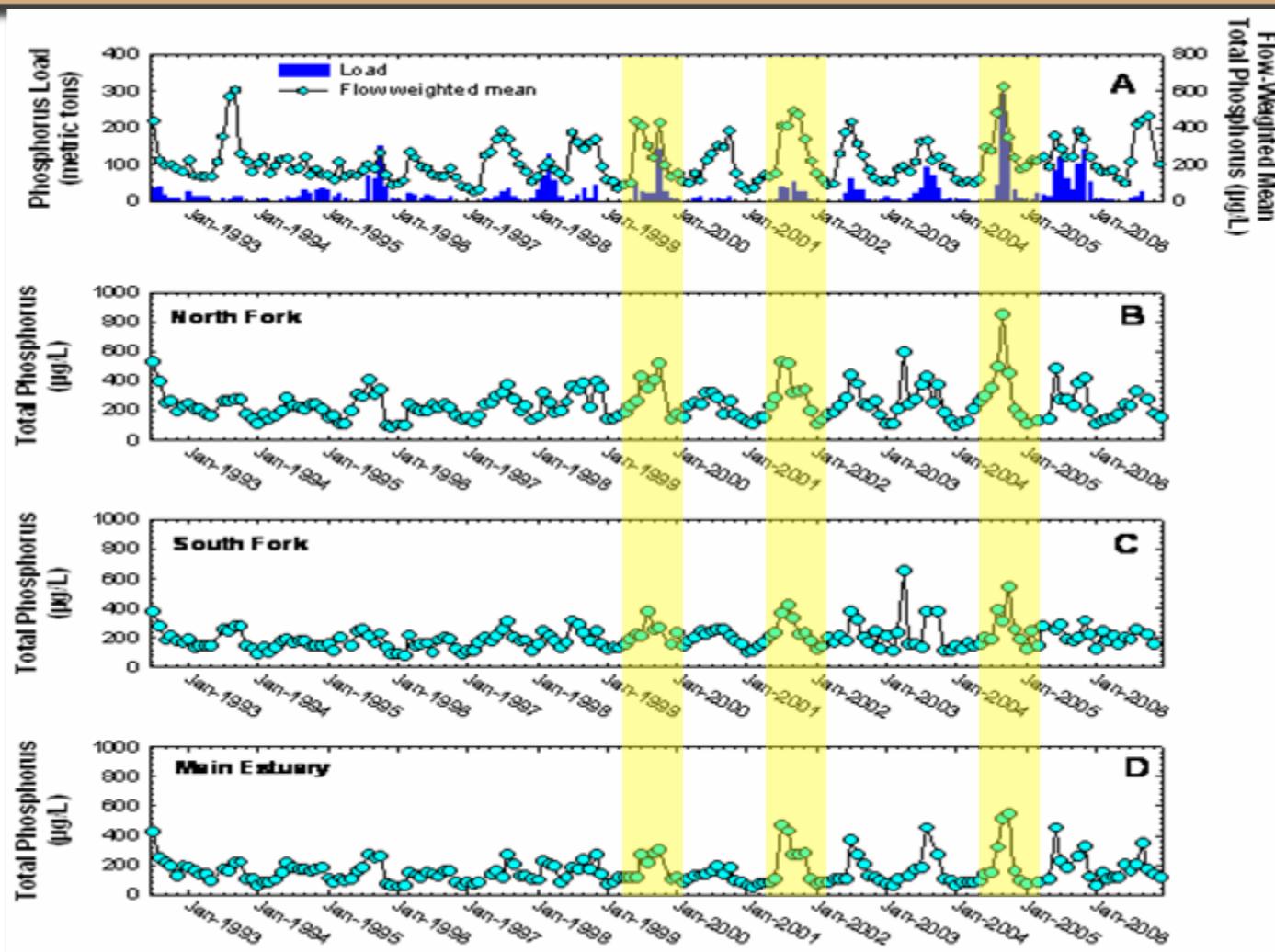


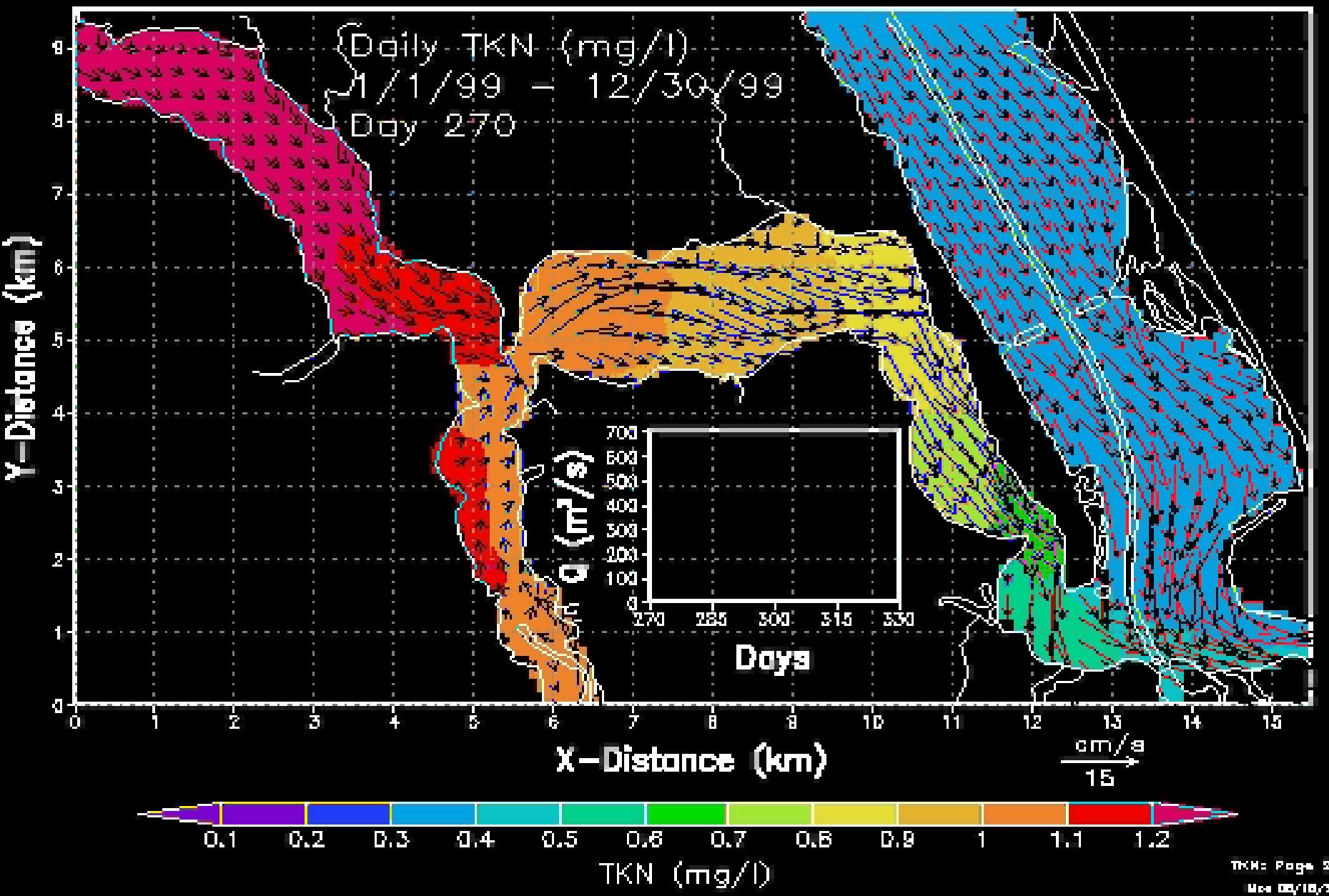
SLE Monthly Median TN Concentration (+/- 25% percentile)



St. Lucie Estuary Water Quality**St. Lucie Estuary Water Quality**

SLE TP Concentration vs. Watershed Loading





Acknowledgements

Boyd Gunsalus

Dan Crean

Cecilia Conrad

Nenad Iricanin

Steve Hill

Guy Germain

Barbara Welch

Pat Gostel

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Discussions

